WHAT IS CLAIMED IS:

1. A method of filling a gap defined by adjacent raised features on a substrate, comprising:

providing a flow of a silicon-containing processing gas to a chamber housing the substrate;

providing a flow of an oxidizing processing gas to the chamber;

providing a flow of a phosphorous-containing processing gas to the chamber;

depositing a first portion of a P-doped silicon oxide film as a substantially conformal layer in the gap by causing a reaction between the silicon-containing processing gas, the phosphorous-containing processing gas, and the oxidizing processing gas, wherein depositing the conformal layer comprises varying over time a ratio of the (silicon-containing processing gas plus phosphorous-containing processing gas):(oxidizing processing gas) and maintaining the temperature of the substrate below about 500°C throughout deposition of the conformal layer; and

thereafter, depositing a second portion of the P-doped silicon oxide film as a bulk layer, wherein depositing a second portion of the film comprises maintaining the ratio of the (silicon-containing processing gas plus phosphorous-containing processing gas):(oxidizing processing gas) substantially constant throughout deposition of the bulk layer and maintaining the temperature of the substrate below about 500°C throughout deposition of the bulk layer.

2. The method of claim 1, further comprising:

thereafter, patterning metal lines on the substrate over the P-doped silicon oxide film; and

maintaining the temperature of the substrate below a reflow temperature of the P-doped silicon oxide film from a point in time immediately after deposition of the bulk layer to a point in time after patterning metal lines on the substrate.

3. The method of claim 2, wherein maintaining the temperature of the substrate below a reflow temperature of the P-doped silicon oxide film from a point in time immediately after deposition of the bulk layer to a point in time after patterning metal lines on the substrate comprises not annealing any portion of the substrate.

4. The method of claim 1, wherein the substrate comprises nickel silicide connectors and the P-doped silicon oxide film comprises a pre-metal dielectric layer.

5. A method of filling a gap defined by adjacent raised features on a substrate, comprising:

providing a flow of a silicon-containing processing gas to a chamber housing the substrate;

providing a flow of an oxidizing processing gas to the chamber;

depositing a first portion of a silicon oxide film as a substantially conformal layer in the gap by causing a reaction between the silicon-containing processing gas and the oxidizing processing gas, wherein depositing the conformal layer comprises varying over time a ratio of the (silicon-containing processing gas):(oxidizing processing gas) and maintaining the temperature of the substrate below about 500°C throughout deposition of the conformal layer;

thereafter, depositing a second portion of the silicon oxide film as a bulk layer, wherein depositing a second portion of the film comprises maintaining the ratio of the (silicon-containing processing gas):(oxidizing processing gas) substantially constant throughout deposition of the bulk layer and maintaining the temperature of the substrate below about 500°C throughout deposition of the bulk layer; and

thereafter, depositing a cap layer comprising a P-doped silicon oxide film while maintaining the substrate below about 500°C throughout deposition of the cap layer.

6. The method of claim 5, further comprising:

thereafter, patterning metal lines on the substrate over the P-doped silicon oxide film; and

maintaining the temperature of the substrate below a reflow temperature of either the silicon oxide film or the P-doped silicon oxide film from a point in time immediately after deposition of the bulk layer to a point in time after patterning metal lines on the substrate.

7. The method of claim 6, wherein maintaining the temperature of the substrate below a reflow temperature of either the silicon oxide film or the P-doped silicon oxide film from a point in time immediately after deposition of the bulk layer to a point in

time after patterning metal lines on the substrate comprises not annealing any portion of the substrate.

8. A method of processing a semiconductor substrate, comprising:

providing a flow of a silicon-containing process gas to a chamber housing the substrate;

providing a flow of an oxidizer process gas to the chamber;

causing a reaction between the silicon-containing process gas and the oxidizing process gas to form a silicon oxide layer on the substrate;

varying over time a ratio of the (silicon-containing gas):(oxidizing gas) flowed into the chamber to alter a rate of deposition of the silicon oxide on the substrate; and

maintaining the substrate at or below a reflow temperature of the silicon oxide layer throughout processing of the semiconductor substrate.

9. The method of claim 8, wherein maintaining the substrate at or below a reflow temperature of the silicon oxide layer throughout processing of the semiconductor substrate comprises not annealing the substrate.

10. The method of claim 8, wherein the silicon oxide layer comprises a pre-metal dielectric layer.

11. The method of claim 8, wherein the substrate comprises a gap between adjacent surfaces, and wherein the silicon oxide is deposited in the gap.

12. The method of claim 8, wherein the substrate comprises nickel silicide.

13. The method of claim 8, further comprising providing a flow of a phosphorous-containing process gas to the chamber during a time period, wherein the flow of silicon-containing process gas is provided at least partly during the time period.

14. The method of claim 13, wherein the silicon-containing process gas comprises TEOS and wherein the phosphorous-containing process gas comprises TEPo.

15. The method of claim 13, further comprising:

thereafter providing a subsequent flow of phosphorous-containing process gas to the chamber.

16. The method of claim 15, further comprising, while providing the subsequent flow of phosphorous-containing process gas to the chamber, regulating a pressure of the chamber to a pressure in a range from about 200 torr to about 760 torr.

17. The method of claim 15, further comprising, while providing the subsequent flow of phosphorous-containing process gas to the chamber, forming a plasma from the phosphorous-containing process gas.

18. The method of claim 17, wherein the plasma has a density greater than about 10^{11} ions/cm^3.

19. A method of processing a semiconductor substrate, comprising:

providing a flow of a silicon-containing process gas to a chamber housing the substrate;

providing a flow of an oxidizing process gas to the chamber;

providing a flow of a phosphorous-containing process gas to the chamber;

causing a reaction between the silicon-containing process gas, the oxidizing process gas, and the phosphorous-containing gas to form a P-doped silicon oxide layer on the substrate; and

varying over time a ratio of the (silicon-containing gas):(oxidizing gas):(phosphorous-containing gas) flowed into the chamber to alter a rate of deposition of the silicon oxide on the substrate.

20. The method of claim 19, further comprising maintaining the substrate at or below at reflow temperature of the P-doped silicon oxide layer.

21. The method of claim 19, wherein the substrate comprises a gap between adjacent surfaces, and wherein the silicon oxide is deposited in the gap.

22. The method of claim 19, wherein the P-doped silicon oxide layer comprises a pre-metal dielectric layer.

23. The method of claim 19, wherein the substrate comprises nickel silicide.

24. The method of claim 19, wherein the silicon-containing process gas comprises TEOS and wherein the phosphorous-containing process gas comprises TEPo.

25. The method of claim 24, further comprising:

thereafter providing a subsequent flow of phosphorous-containing process gas to the chamber.

26. The method of claim 25, further comprising, while providing the subsequent flow of phosphorous-containing process gas to the chamber, regulating a pressure of the chamber to a pressure in a range from about 200 torr to about 760 torr.

27. The method of claim 25, further comprising, while providing the subsequent flow of phosphorous-containing process gas to the chamber, forming a plasma from the phosphorous-containing process gas.

28. The method of claim 27, wherein the plasma has a density greater than about 10^{11} ions/cm^3.